

# Watershed Conservation Resource Center

## 319 Program Stream Restoration Projects Update

- WFWR Near Brentwood
  - 07-400 (Original Project Completed 2010)
  - 07-2000 Project Repair/Maintenance
- White River Bank Stabilization
  - 09-1900
- WFWR Fayetteville Executive Airport
  - 07-410 Phase I (Completed 2011)
  - 09-1600 Phase II



# 07-400/07-2000 West Fork White River Stream Restoration Project Update



**Watershed Conservation Resource Center**

Arkansas Game and Fish Commission, Beaver Water District, Northwest Arkansas Land Trust,  
Arkansas Natural Resources Commission, Environmental Protection Agency

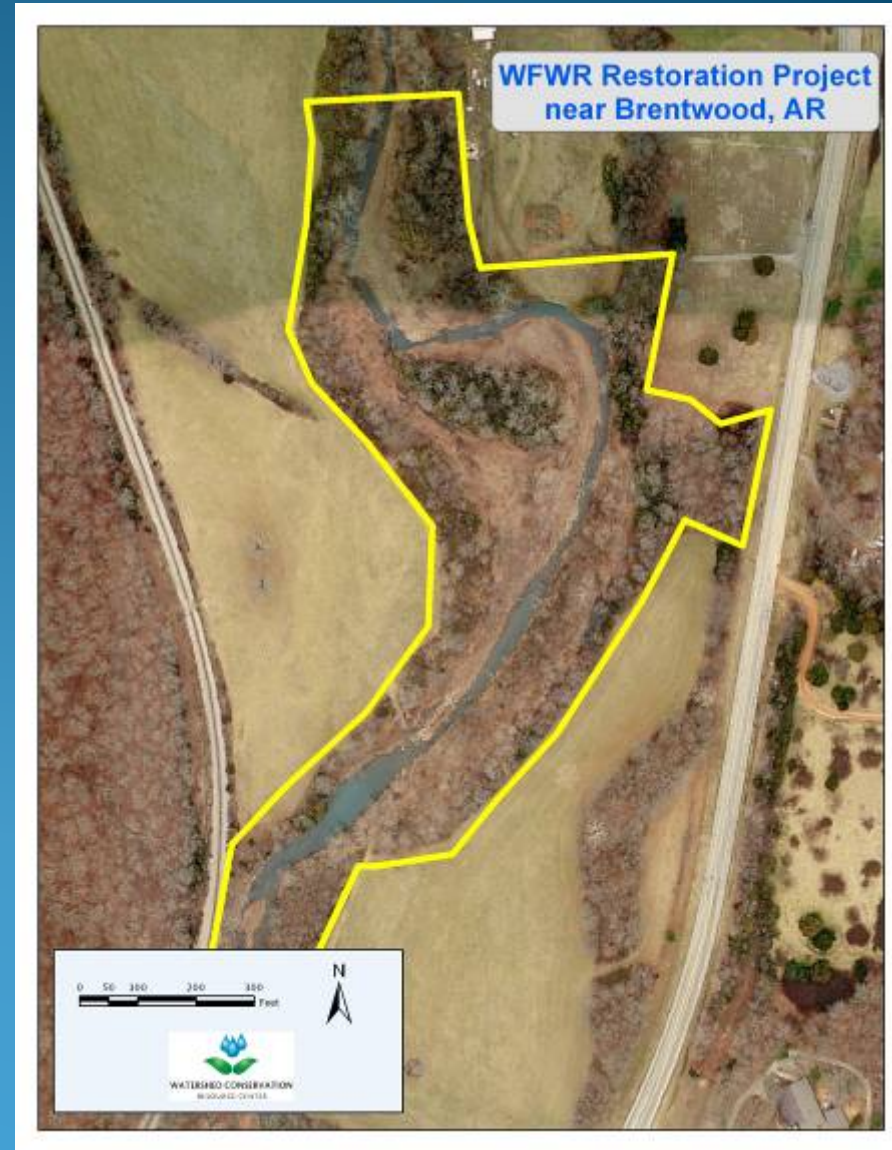
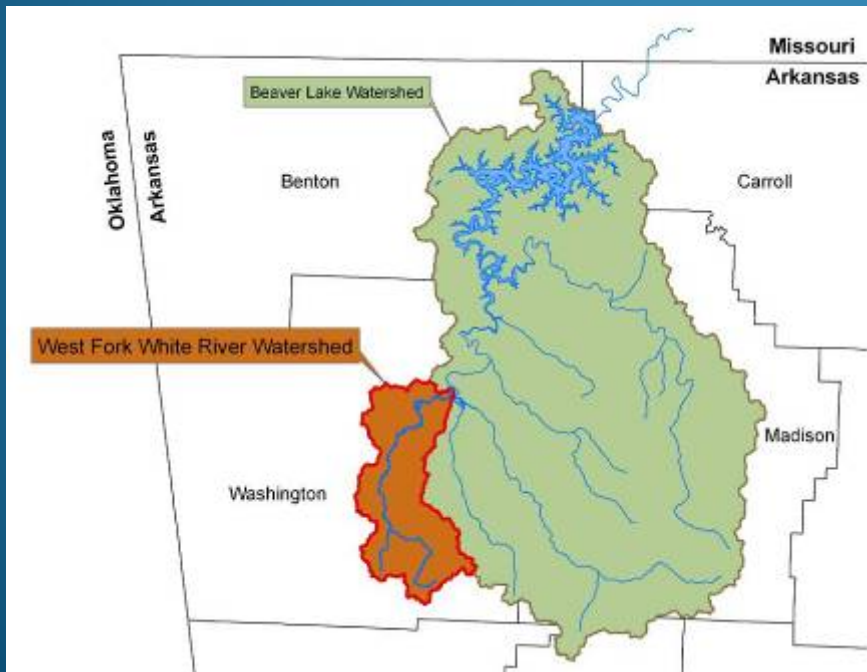
# Project Goal

Demonstrate an rural stream restoration using a natural channel design approach



# WFWR near Brentwood, AR

- Drainage Area 18 mi<sup>2</sup>
- Rural Watershed
  - Forest
  - Pasture
- ~1,800' of Stream Channel
- Rosgen C4/1-Type Stream
- 3 Landowners



# Site Photos Before Restoration (upstream)



# Site Photos Before Restoration (mid-section)



# Site Photos Before Restoration (downstream)



# Site Photos Before Restoration (downstream)

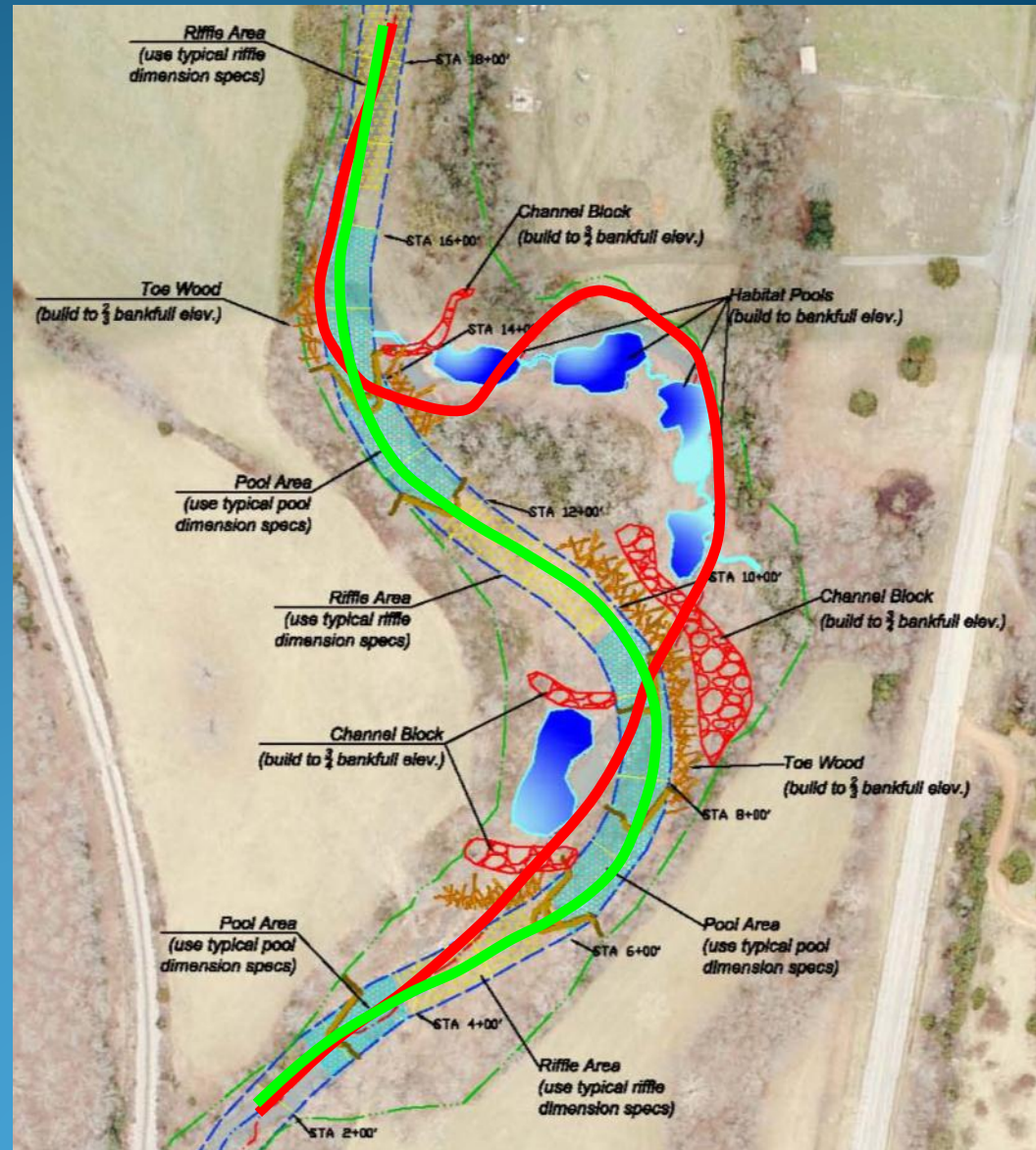




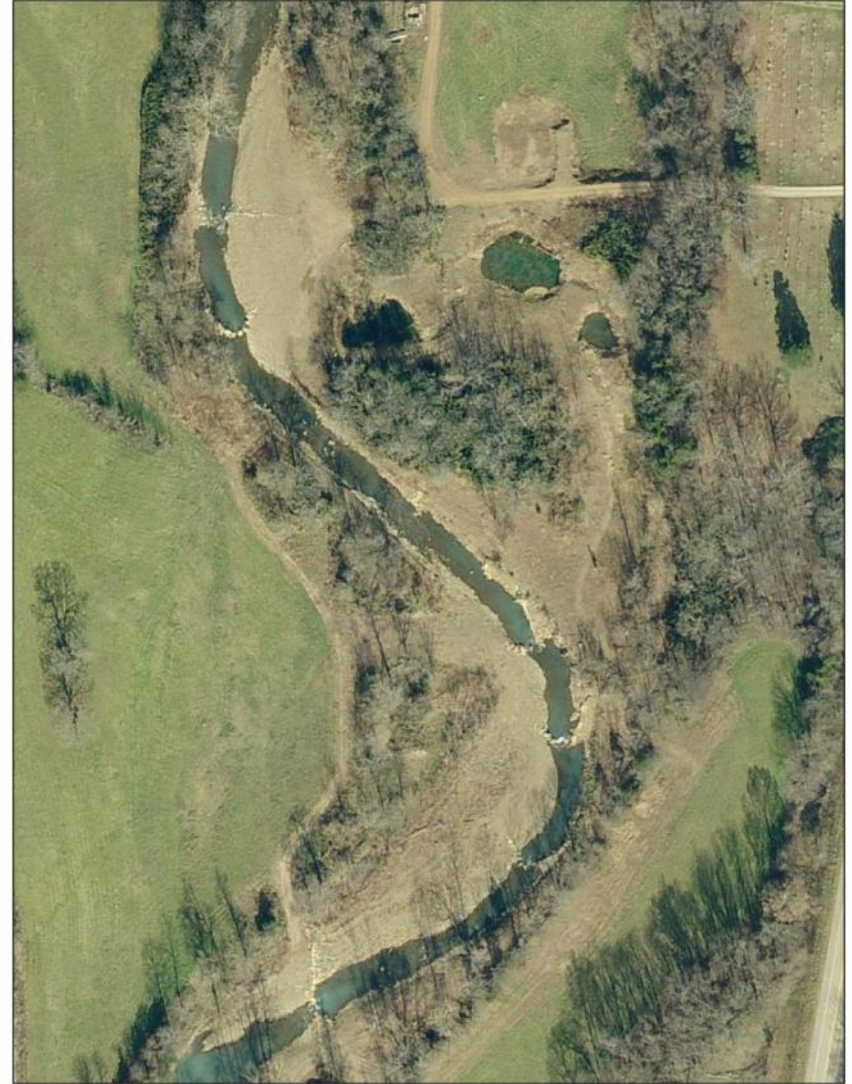
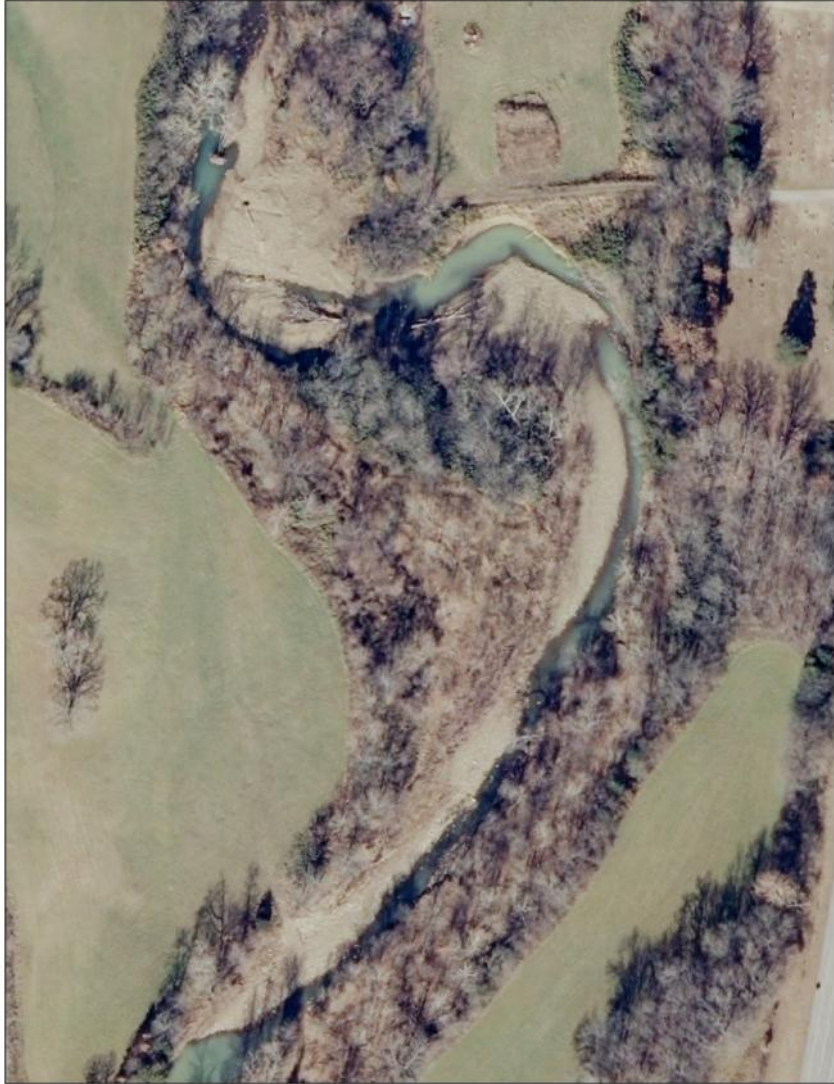
# Stream Restoration Design

## General Design Approach

1. Eliminate Tight Meander Bend Radii
2. Avoid Old Growth Riparian Areas
3. Maintain Stream Length
4. Create Wetlands



# Stream Restoration Design



# Site Photos After Restoration (upstream)



# Site Photos After Restoration (mid-section)



# Site Photos After Restoration (mid-section)



# Site Photos After Restoration (downstream)

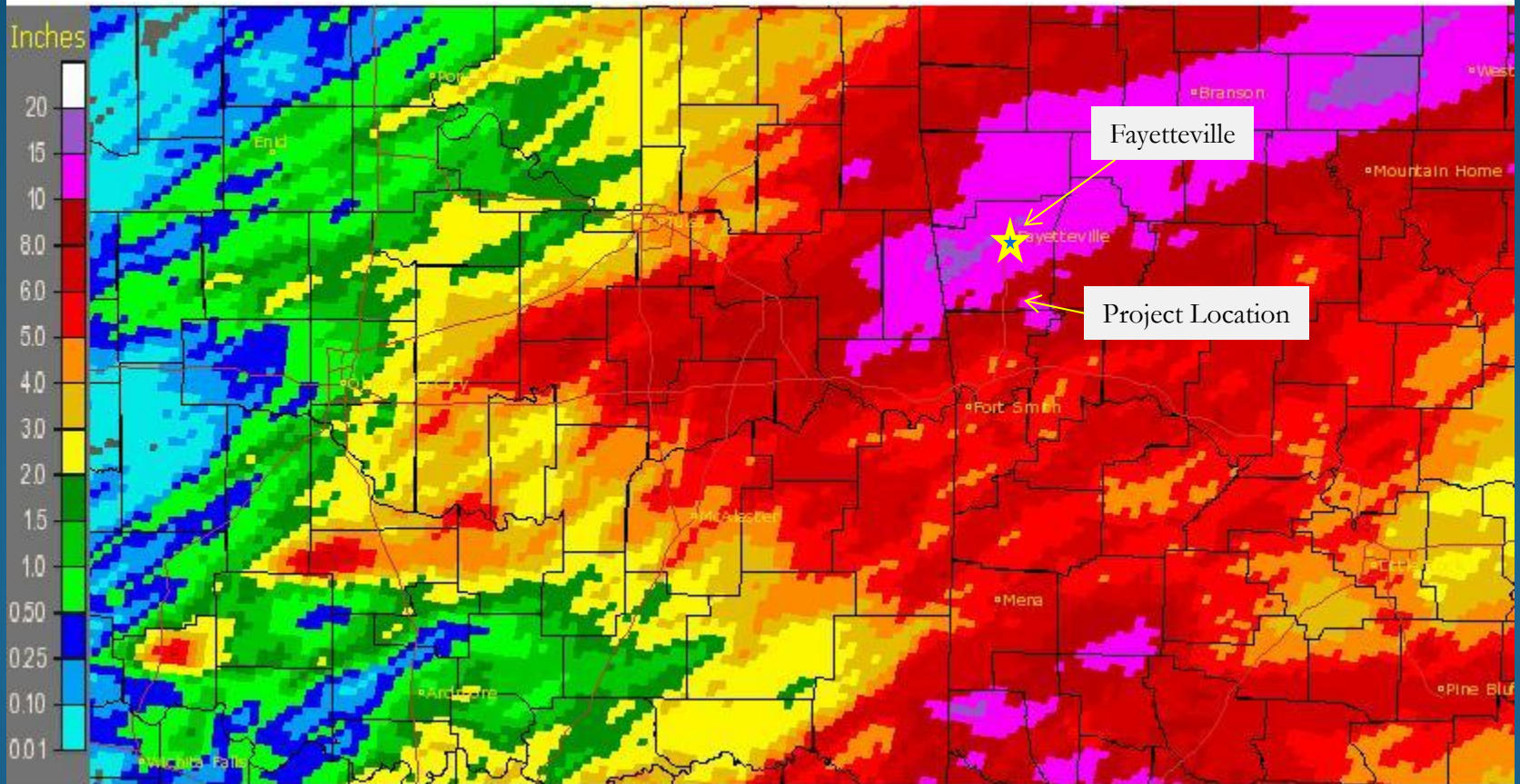


# Site Photos: Constructed Wetlands



# April Flood – NWA 2011

Tulsa, OK (TSA): Current 7-Day Observed Precipitation  
Valid at 4/26/2011 1200 UTC– Created 4/26/11 16:09 UTC




- 10”-14” Rainfall over 7 Days
- 4”-6” Rainfall fell on during the PM of April 25<sup>th</sup>



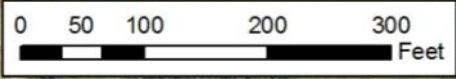
# April Flood – NWA 2011

## White River at Wyman Bridge

USGS Gage 07048600

Water Year	Hours Above $Q_{bkf}$	Annual Max Q
2001	4	10,600
2002	92	49,900
2003	28	16,000
2004	58	140,000
2005	40	14,700
2006	14	16,800
2007	43	21,500
2008	24	79,400
2009	36	18,400
2010	50	38,100
<b>Average</b>	<b>39</b>	<b>40,540</b>
		
<b>2011 Flood</b>	<b>63</b>	<b>130,000</b>





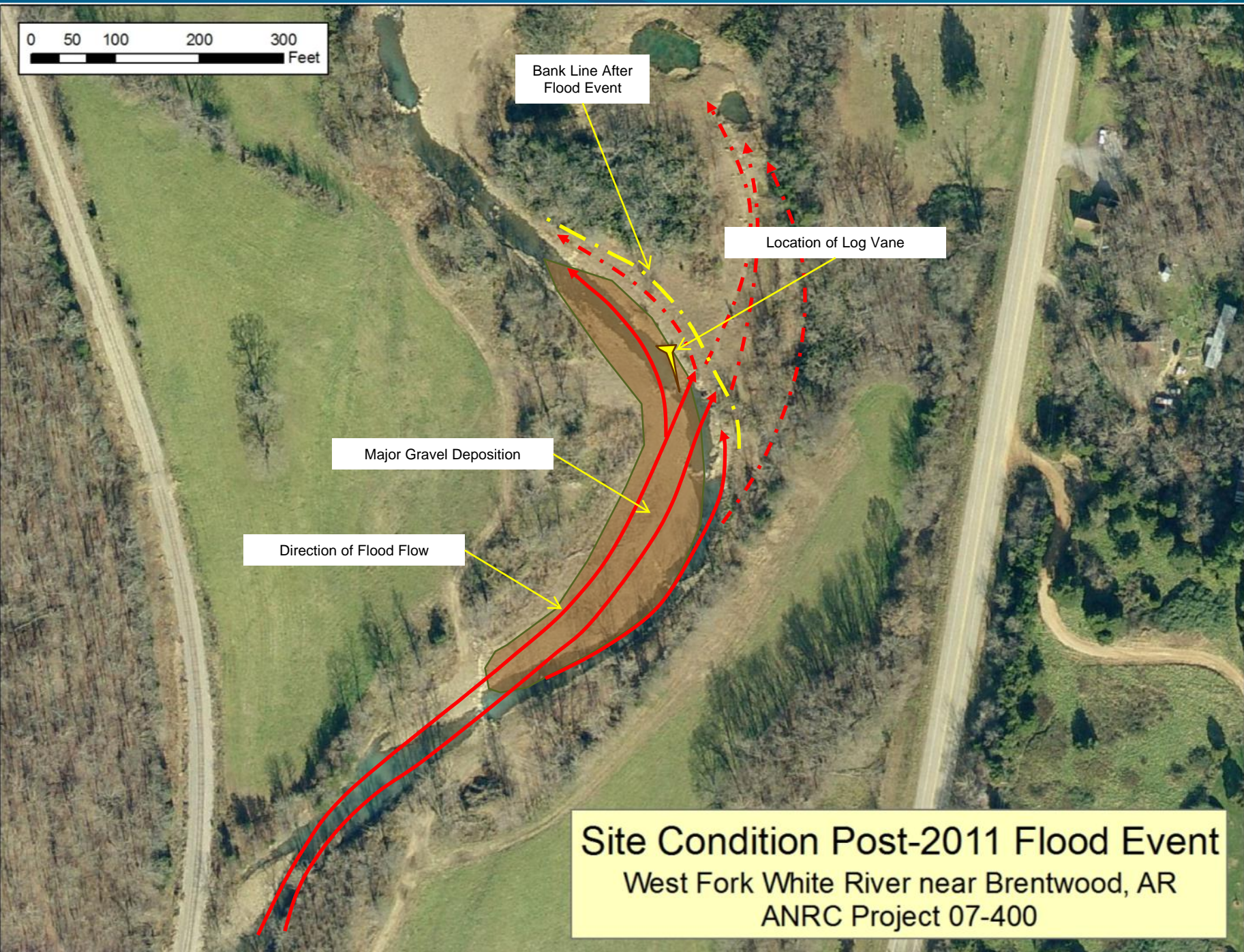
Bank Line After Flood Event

Location of Log Vane

Major Gravel Deposition

Direction of Flood Flow

Site Condition Post-2011 Flood Event  
West Fork White River near Brentwood, AR  
ANRC Project 07-400



# WFWR Steam Restoration Flood Damage

Aggradation/Enchroachment  
on Rock Vane

Direction of Flow  
During High Water

Aggradation from Backwater  
(caused by flow running  
directly into bank)



# WFWR Steam Restoration Flood Damage



# WFWR Steam Restoration Repairs

- Reinforce plug toe with large rock
- Create bankfull bench on new toe
- Construct a rock vane to protect plug
- Remove accumulated gravels



# WFWR Steam Restoration

Although historic flooding caused damage to the project in 2011, significant loads reductions are being realized

Year	Load Reduction	
	Total Sediment (ton/yr)	Total Phos. (lb/yr)
2009	≈2,000	≈650
2010	≥ 2,000	≥ 650
April 2011	2,000 to 4,000	650 to 1,300
<b>Total</b>	<b>6,000 to 8,000</b>	<b>1,950 to 2,600</b>

Without this project:

- Land would have been lost
- Un-marked Graves would have been threatened
  - Access road would have been destroyed
  - River instability would increase

# Lessons Learned

- Avoid Placement of Log Vanes in Critical Areas
- Priority 2 Restoration – Watch flood channel dimensions within and upstream and downstream of your project
- Priority 2 Restoration: Plan for Channel Maintenance
- “Work with the River” when possible
- Go with rock in most vulnerable areas
- Develop contingency funding mechanisms
  - Bonds
  - Set-asides
- Pre-implementation budgets and on the ground realities do not always coincide
- Get in and repair ASAP to avoid further damage

# 09-1900 White River Bank Stabilization Project



**Watershed Conservation Resource Center**

City of Fayetteville, CH2M Hill, Arkansas Natural Resources Commission,  
Environmental Protection Agency

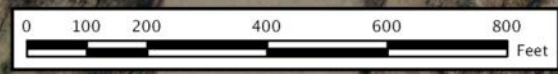


# White River Bank Stabilization Project City of Fayetteville, AR

Latitude: 36.09N Longitude: 94.06W



PROJECT EXTENT (~1,400')

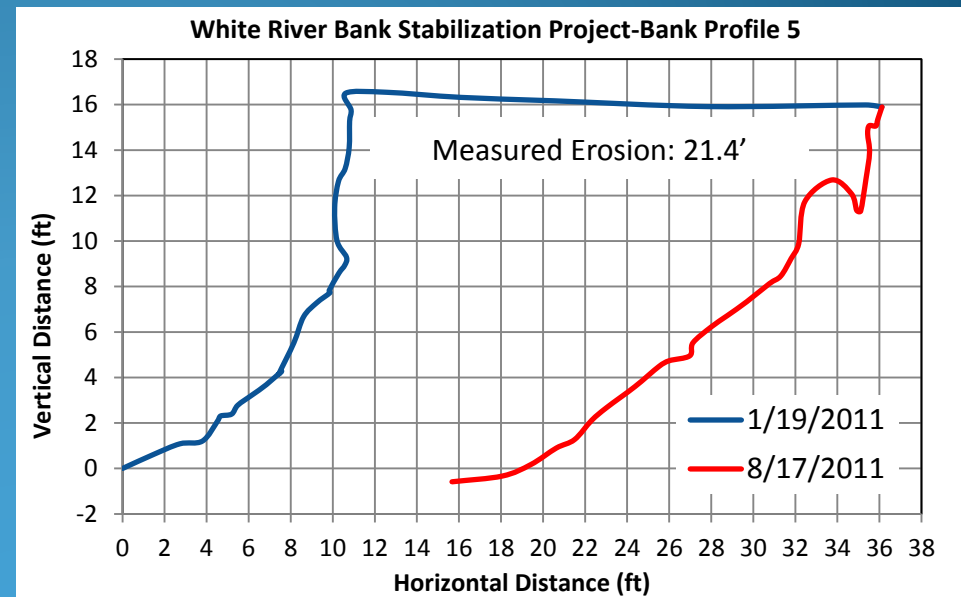


# Erosion During Bankfull Event

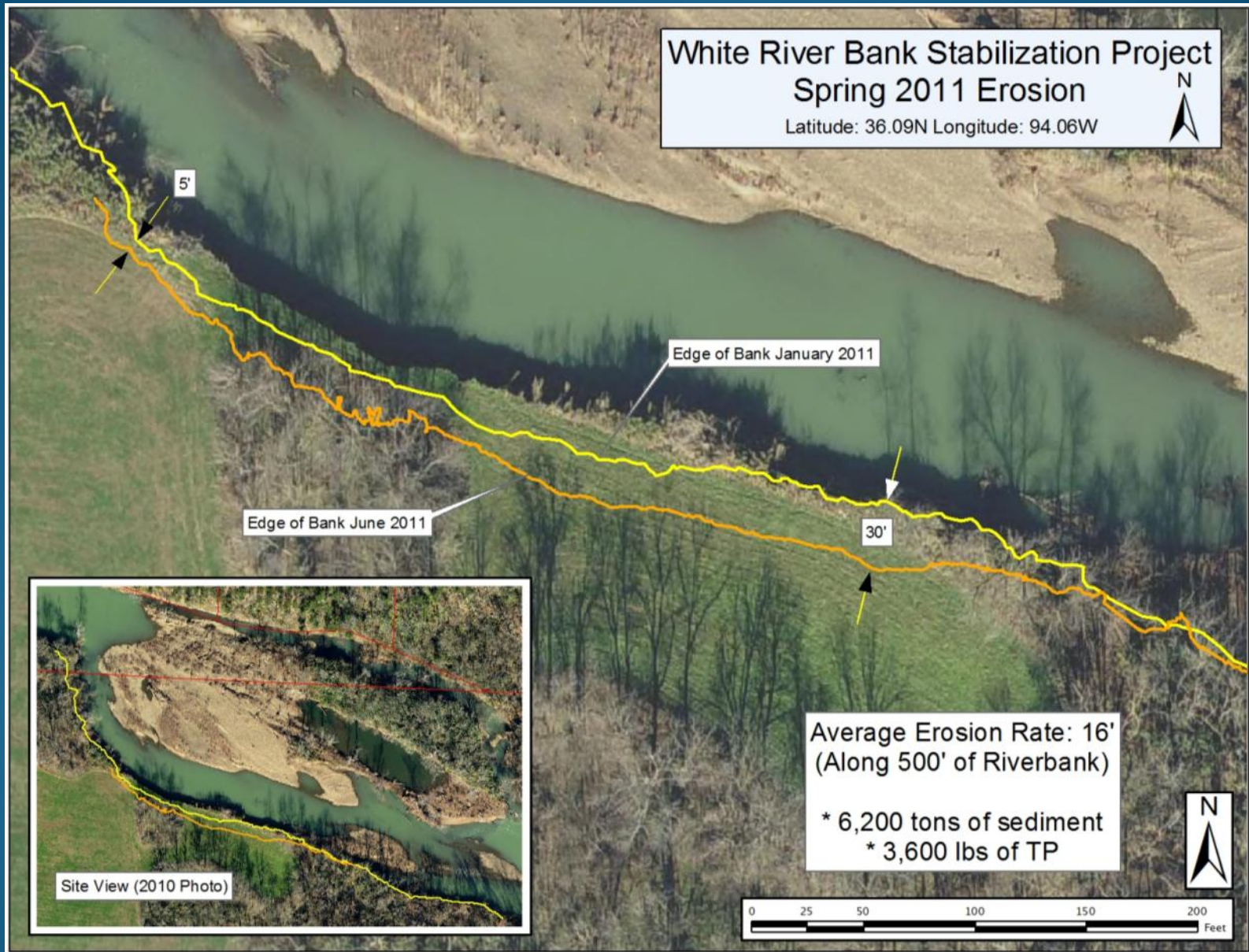


# Pre-Restoration Site Monitoring

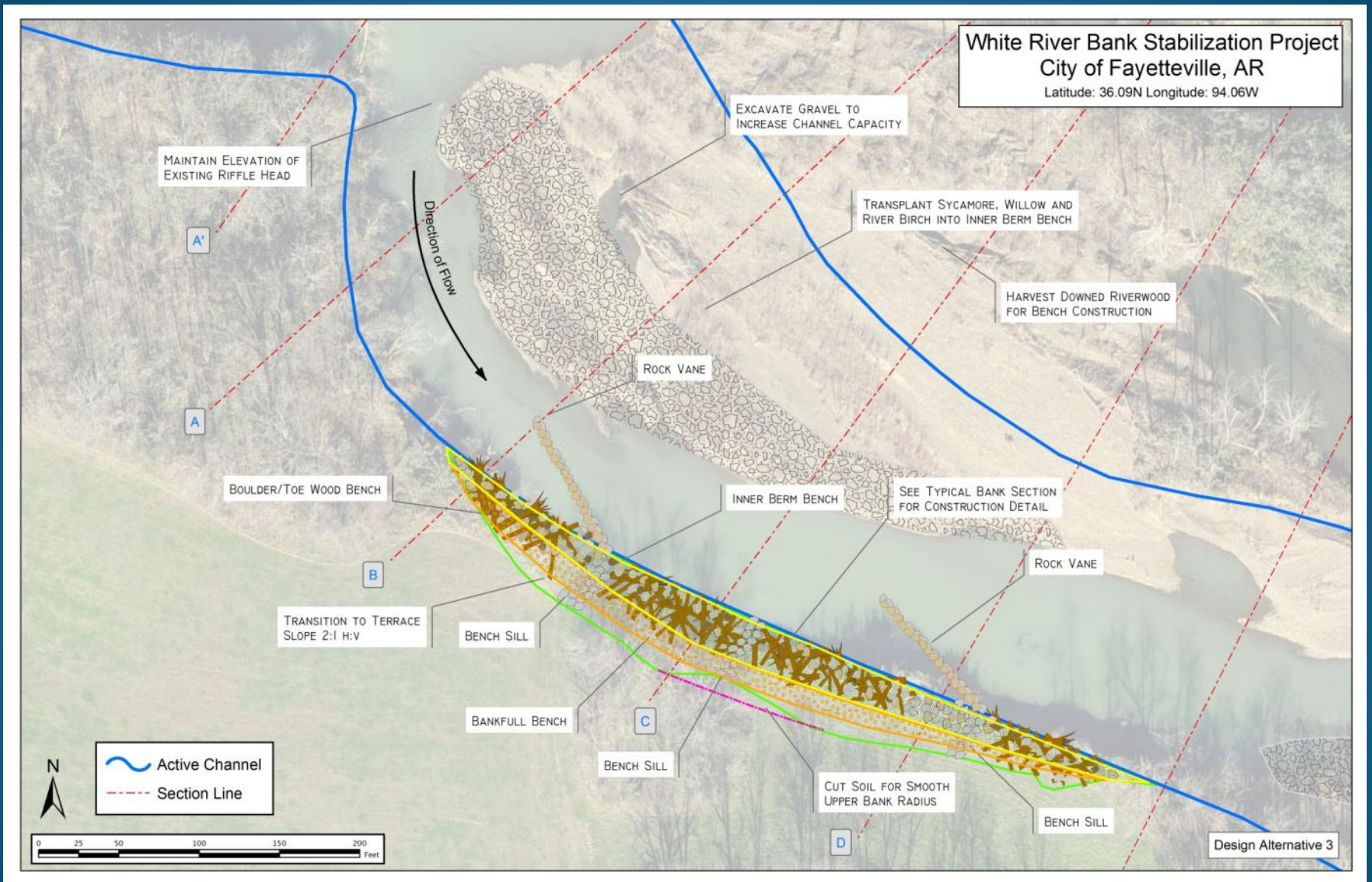
- Bank Erosion Monitoring
  - Toe Pin Installation
  - Resurvey After Spring Rain
- Bank Material Sampling
  - 30 Samples
  - Particle Size and Nutrient Analysis



# Pre-Restoration Site Monitoring



# Restoration Design

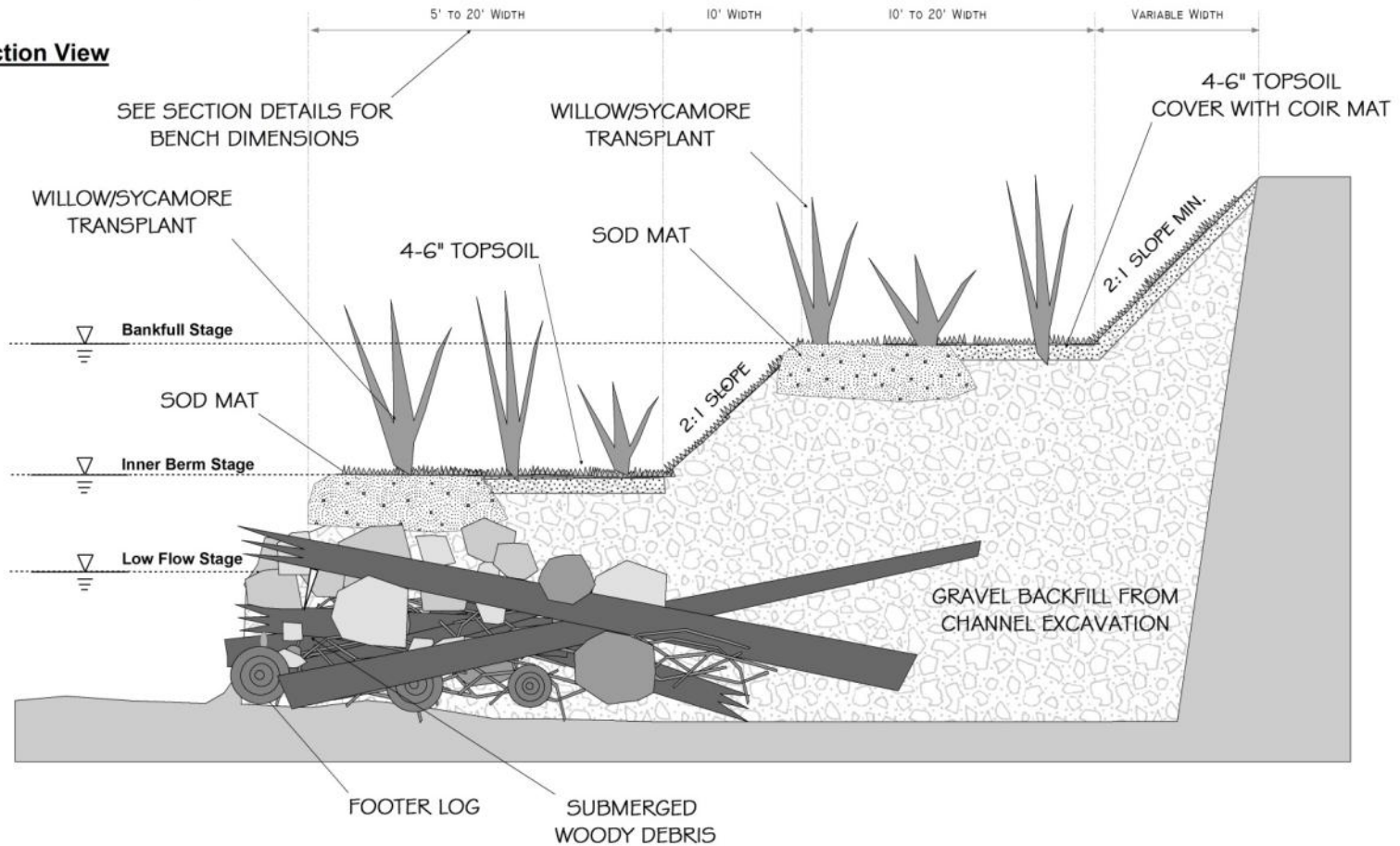


# Restoration Design

SCALE: NTS

## Boulder and Wood Toe - Bank and Bench Construction Details

### Section View



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Fayetteville  
ARKANSAS

# Project Status and Schedule

- Develop QAPP ✓
- Collect Pre-Implementation Data ✓
  - Bank erosion inventory ✓
  - Install and survey toe pins ✓
  - Collect and Analyze Bank Samples ✓
  - Survey site morphology ✓
  - Re-survey toe pins to estimate erosion ✓
- Develop Stabilization Plan **Ongoing**
  - Construction Documents **Nearly Completed**
  - Request Bids **Late September / Early October**
- Implement Plan **November / December 2011**
- Follow-up Monitoring **Through 2012**



**Greatest constraint remaining is water levels during proposed construction timeframe**

# 07-410 WFWR Airport Phase I

## 09-2000 WFWR Airport Phase II



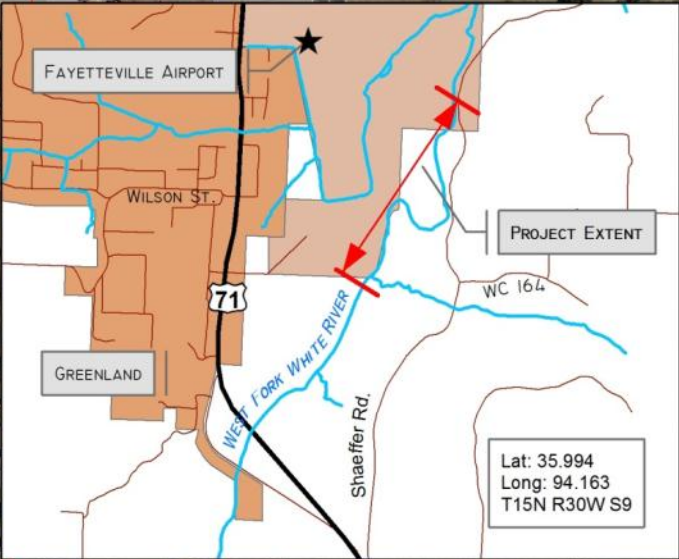
### **Watershed Conservation Resource Center**

City of Fayetteville, Beaver Water District, Arkansas Game and Fish Commission,  
Arkansas Natural Resources Commission, Environmental Protection Agency



WFWR RESTORATION - PHASE I  
FAYETTEVILLE EXECUTIVE AIRPORT  
PROJECT 07-410

PROJECT END



CITY OF FAYETTEVILLE

CITY OF FAYETTEVILLE

PRIVATE LANDOWNER

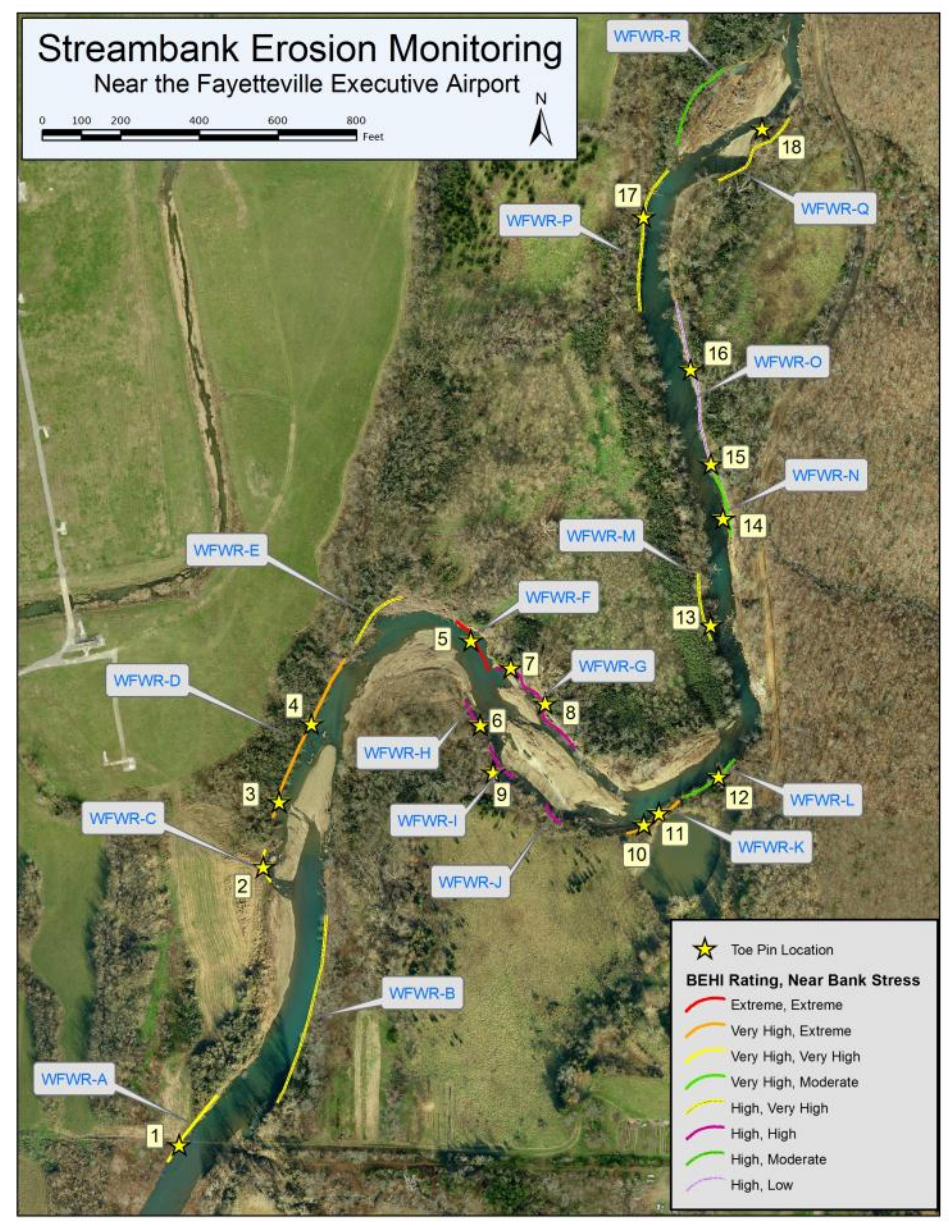
PROJECT LENGTH ~4,600 FT.

CITY OF FAYETTEVILLE  
PRIVATE LANDOWNER





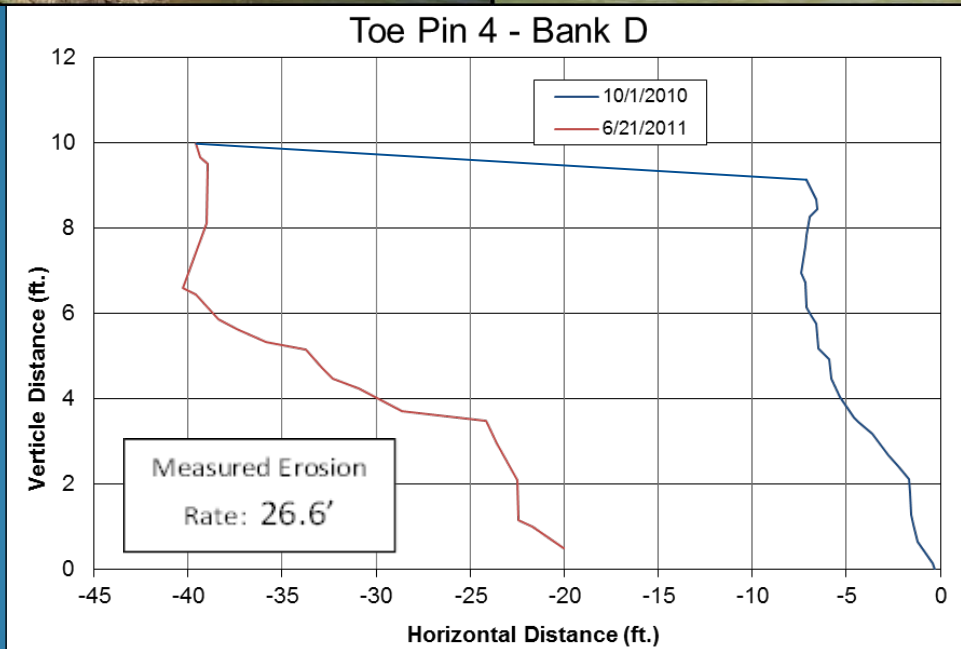
# Pre-Restoration Site Monitoring



# Pre-Restoration Site Monitoring

Bank ID	Estimated Average Annual Erosion Rate (ft/yr)	Estimated Average Annual Sediment Load (ton/yr)	Estimated Average Annual TP Load (lb/yr)	Estimated Average Annual TN (lb/yr)
A	0.6	83	48	149
B	0.3	62	38	120
C	1.0	33	17	44
D	7.9	1,510	652	2,291
E	0.5	26	17	55
F	16.0	1,380	691	1,580
G	0.4	52	34	108
H	0.6	9	4	10
I	0.3	8	6	16
J	0.4	10	5	15
K	7.4	773	225	631
L	0.2	22	7	16
M	0.7	53	31	101
N	0.5	52	23	77
O	0.2	58	44	128
P	0.5	125	57	137
Q	0.4	29	13	38
R	0.3	32	21	68
<b>Total</b>		<b>4,318</b>	<b>1,933</b>	<b>5,583</b>

# Pre-Restoration Site Monitoring



# Pre-Restoration Site Monitoring

Bank ID	Measured Erosion Rate** (ft/yr)	Sediment Load Based on Measurements (ton/yr)	TP Load Based on Measurements* (lb/yr)	TN Load Based on Measurements* (lb/yr)
A	10.5	1,150	671	2,065
B	3.0*	438	272	851
C	3.0*	95	51	126
D	26.6	5,096	2,199	7,732
E	3.0*	170	111	357
F	22.4	3,491	1,747	3,998
G	1.0*	127	82	266
H	1.0*	15	7	18
I	1.0*	25	16	48
J	1.0*	26	13	38
K	1.0	128	37	104
L	1.1	72	22	52
M	5.7	427	248	821
N	1.6	170	74	250
O	0.9	223	169	490
P	3.0	576	263	627
Q	1.0*	81	37	106
R	1.06*	108	70	226
<b>Total</b>		<b>12,419</b>	<b>6,091</b>	<b>18,176</b>

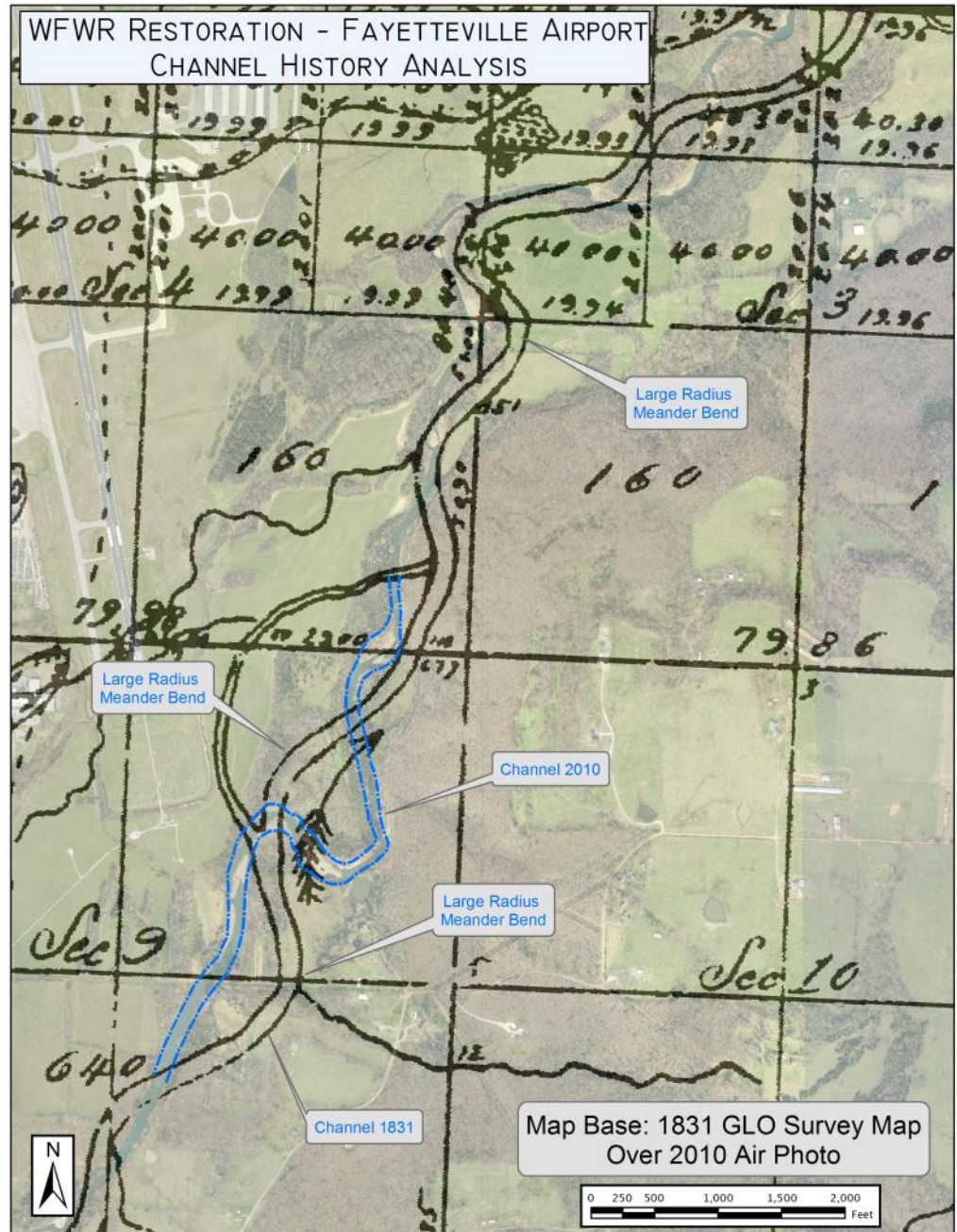
\* Estimated from measured erosion rates for streambanks with similar BEHI/NBS conditions  
 \*\* Two large magnitude flood events occurred during the monitoring period

Measured loading rates exceeded predicted erosion rates by 3x due to Spring floods in NWA

# Pre-Restoration Site Monitoring

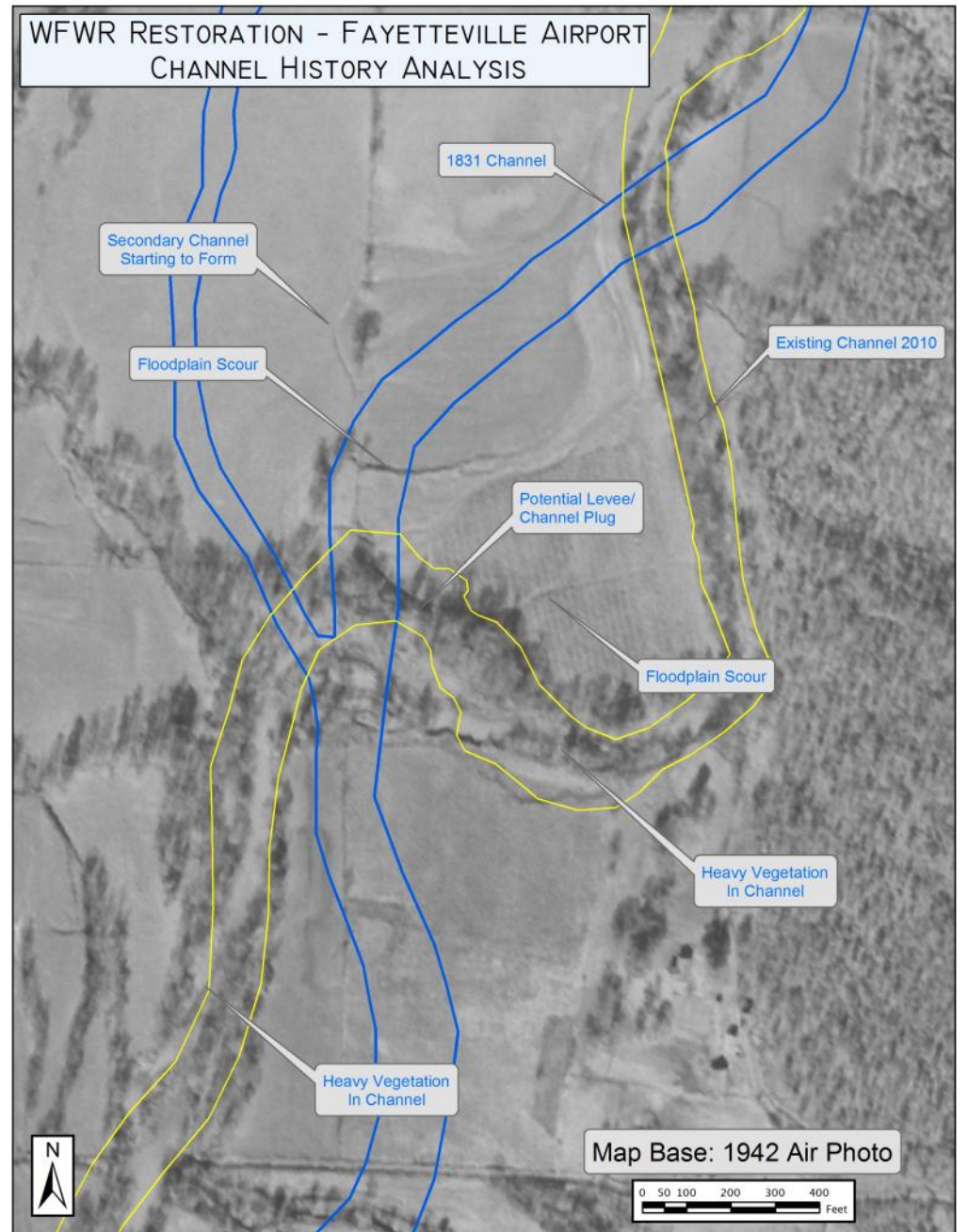


# Site History

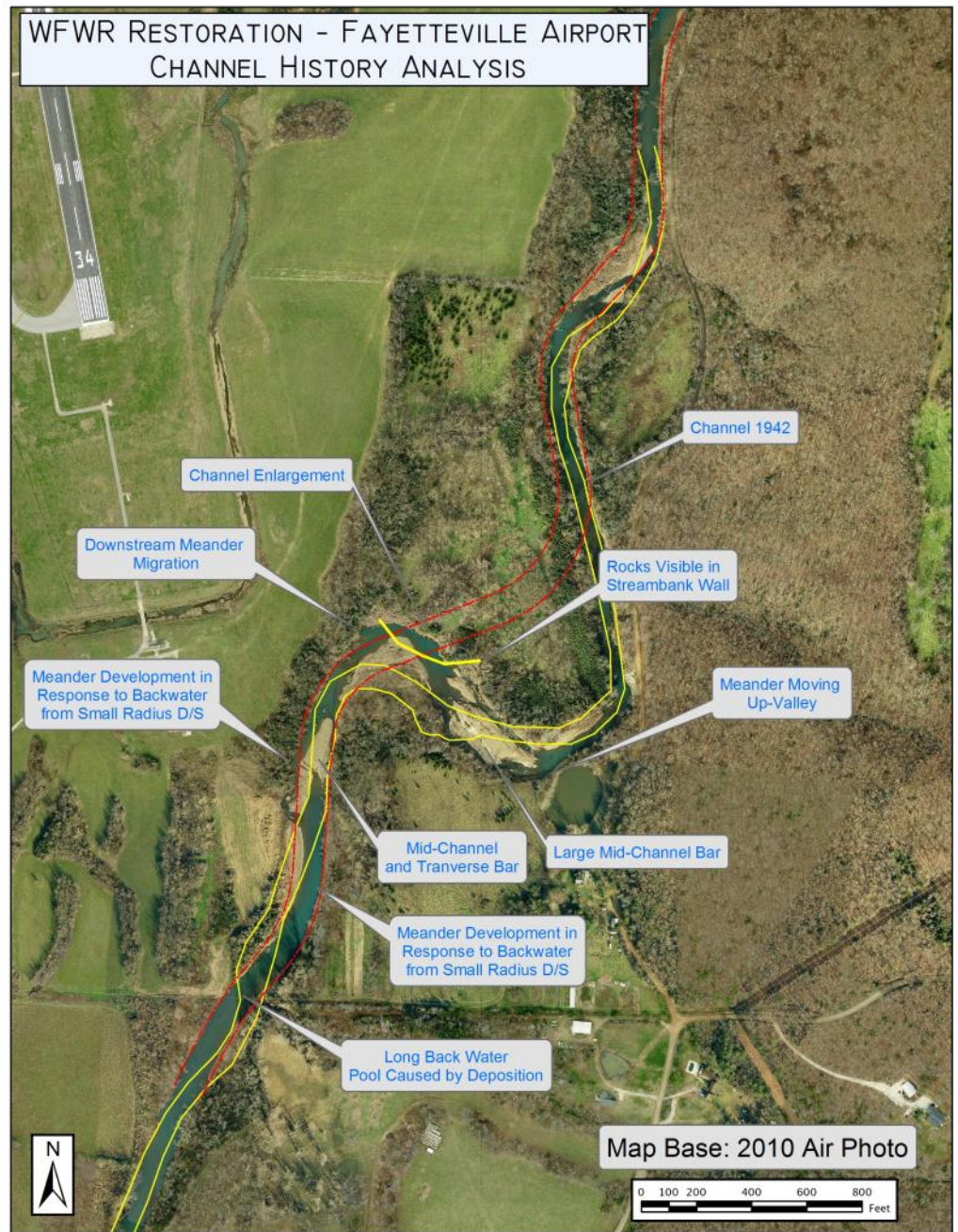




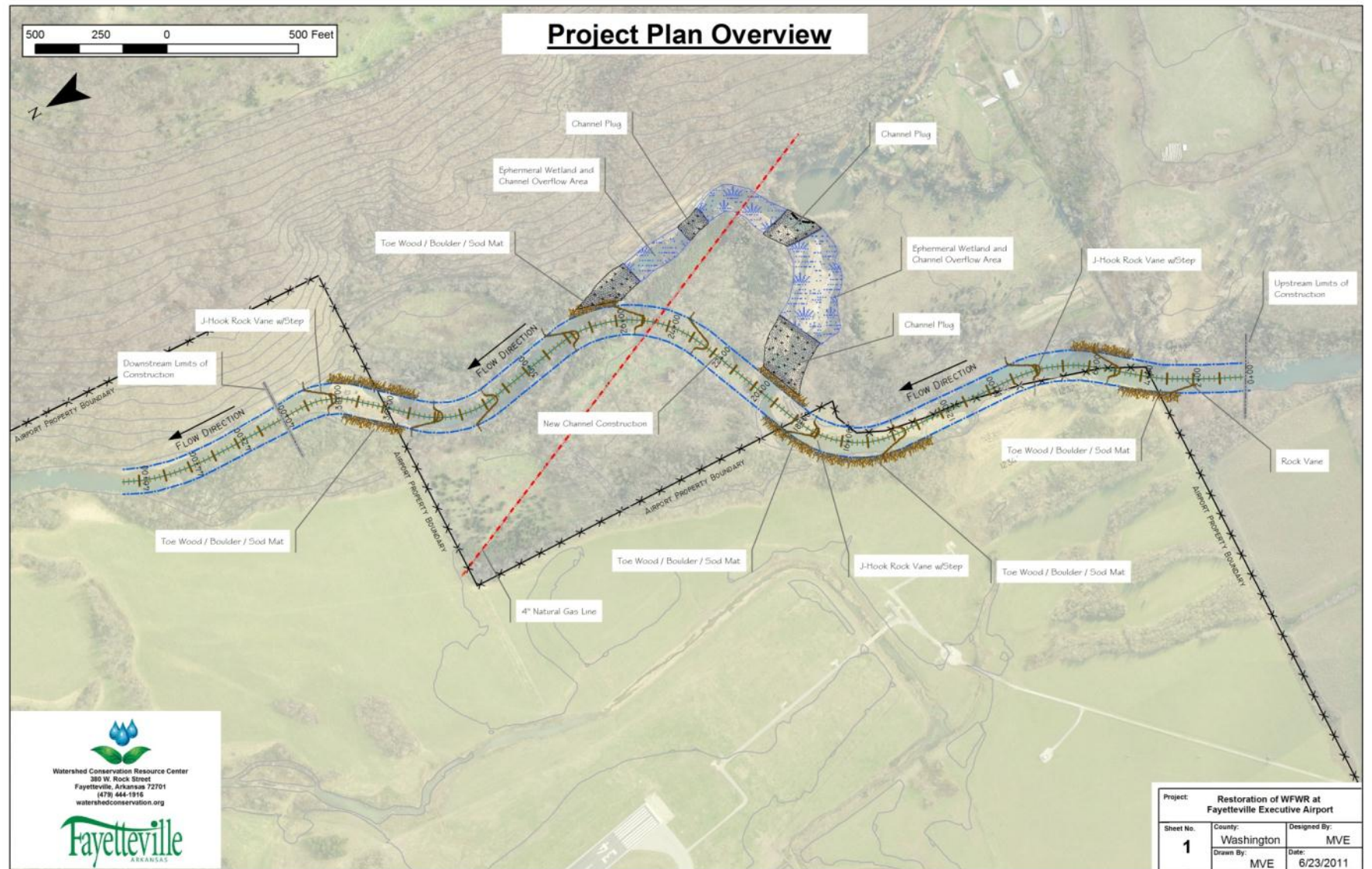
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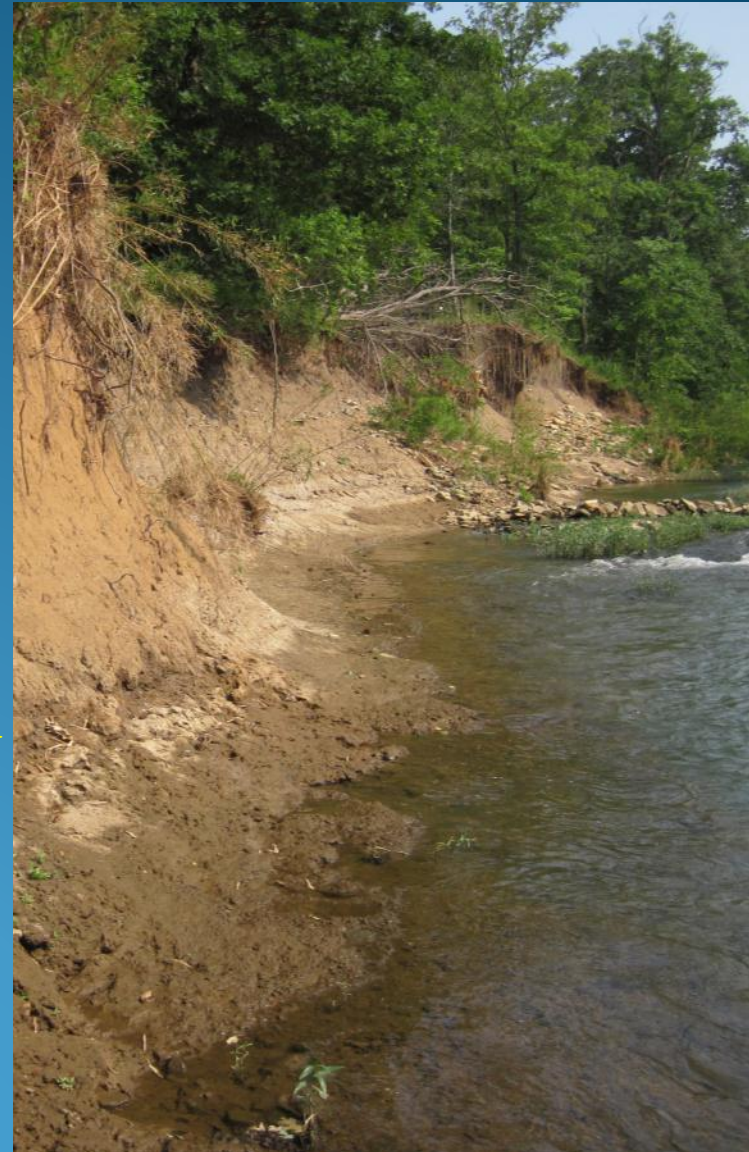


# Restoration Design



# Project Status and Schedule

- Develop QAPP ✓
- Collect Pre-Implementation Data ✓
  - Bank erosion inventory ✓
  - Install and survey toe pins ✓
  - Collect and Analyze Bank Samples ✓
  - Survey site morphology ✓
  - Re-survey toe pins to estimate erosion ✓
  - Biologic Monitoring ✓
- Develop Restoration Plan **Ongoing**
  - Create Construction Documents **Completed**
  - Request Bids **Early 2012**
- Implement Plan
  - Lower Gas Line **Spring 2012**
  - Construct Project **Summer 2012**
- Follow-up Monitoring **Through 2013**



# Questions and Discussion

